

IC CARD WITH DISPLAY AND CARD RECORDING AND READING DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an information card having a semiconductor IC encapsulated in an insulating plastic substrate for use as a validation card, an admission checking card, a credit card, or the like in business transactions and personal identification, and more particularly to an IC card having a display capability and an IC card reader for reading recorded information from such an IC card.

2. Description of the Related Art

Automatic cash dispensing and depositing machines in banks and other monetary organizations are operated to dispense or deposit bank notes by cash cards inserted by the customers who enter necessary input data into the machine. The details of the transaction are recorded on a slip issued from the machine or on the passbook which is inserted by the customer into the machine.

The conventional automatic cash dispensing and depositing machines are however disadvantageous in that the customers are required to handle three different mediums, i.e., the cash card, the bank note, and the slip or passbook, independently or in combination, a process which has been complex to make in connection with the machine.

The automatic cash dispensing and depositing machine is required to have a cash dispensing and depositing ability, an ability to read data from the magnetic stripes on cash cards, an ability to print transaction details on slips and issue them, and an ability to print transaction details on passbooks. Therefore, the machine has been complicated in structure and expensive to manufacture.

There have recently been proposed IC cards and IC card readers, the IC card being composed of a semiconductor IC including a data processing circuit and a memory circuit and encapsulated in a insulating card substrate. However, the proposed IC cards and IC card readers have not yet been successful in solving the aforesaid problems.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide an IC card having a business transaction capability, a personal identification capability, a data recording and reading capability, and a data displaying ability for simplifying a process which is needed to operate a machine such as an automatic cash dispensing and depositing machine.

Another object of the present invention to provide an IC card reader designed to reduce the cost of manufacture of a machine such as an automatic cash dispensing and depositing machine in which the IC card reader is incorporated.

To achieve the above objects, an IC card includes an integrated circuit composed of a transmitter/receiver, a processor, a memory, and a display controller, a display, and control switches for successive switching of the display.

Data items can be stored in the memory through the transmitter/receiver and the processor, and read out of the memory through the transmitter/receiver and the processor. Desired data which is stored in the memory can be displayed on the display by a command given

through the transmitter/receiver, or operation of the control switches.

The above objects can also be achieved by an IC card having a transmitting means and a receiving means which are electrically or optically coupled respectively to the receiver and transmitter, respectively, of an IC card reader, a transmitter/receiver for transmitting data to and receiving data from the IC card reader through the transmitting and receiving means, a processor for processing the data, a memory for storing the data, a display for displaying the data stored in the memory, control switches and a display controller for processing the data stored in the memory so as to display the data on the display, and a power supply means. The IC card reader also includes a processor/memory for recording the data in and reading the data from the IC card through the transmitter/receiver, and a means for controlling the stored data to be displayed on the display of the IC card dependent on the processed result.

Data items can be read from the memory of the IC card through the transmitter/receiver and the processor by means of the processor/memory of the IC card reader, and can be stored into the memory of the IC card through the transmitter/receiver and the processor by means of the processor/memory of the IC card reader. Desired data can be displayed on the display through the display controller by means of the processor/memory and the control switches.

The above and other objects, features and advantages of the present invention will become more apparent from the following description when taken in conjunction with the accompanying drawings in which preferred embodiments of the present invention are shown by way of illustrative example.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram of the circuit arrangement of an IC card according to the present invention;

FIG. 2 is a plan view of the IC card of the invention;

FIG. 3 is a block diagram of the IC card as set in an IC card reader according to the present invention;

FIG. 4 is a sectional side elevational view of the IC card reader of the invention;

FIG. 5, consisting of FIGS. 5A-5D, is a flowchart of cash dispensing operation carried out by the IC card and the IC card reader;

FIG. 6, consisting of FIGS. 6A-6B, is a block diagram of the integrated circuit of an IC card according to another embodiment of the present invention, the view showing the manner in which data stored in the IC card is successively displayed; and

FIG. 7, consisting of FIGS. 7A-7D, is a flowchart of operation of the IC card shown in FIG. 6.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As shown in FIG. 1, an IC card 1 is composed of an insulating plastic substrate and various circuit components, described below, encapsulated in the insulating plastic substrate.

An integrated circuit 2 encapsulated in the substrate includes electronic circuits such as a processor and signal processing circuits, as described later on.

A liquid crystal display 3 is encapsulated in the substrate. A signal receiving means 4 is capable of receiving signals from an external device such as an IC card reader (described below). A signal transmitting means 5